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SURFACE DUCT, ROUGH SURFACE SCATTERING, AND
CUSPED CAUSTIC IMPROVEMENTS FOR FACT

SAI-82-472-WA

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CUSPED CAUSTIC IMPROVEMENTS FOR FACT

SAI-82-472-WA

March 1981

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Naval Ocean Research and Development Activity
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ABSTRACT

In September 1980 SAI was tasked to support the Tactical ASW Environmental Acoustic Support (TAEAS) project in developing Navy Standard Transmission-Loss Model (FACT) updates that incorporated several previously developed routines. Specifically the modifications addressed problems associated with surface ducts, cusped caustics, and the treatment of rough surface losses.

These modifications have been assembled and provided to NORDA 320 for distribution. The computer implementation of these improvements is briefly described in this report; complete technical documentation and test cases are included in a companion report.

SUMMARY OF FACT MODIFICATIONS

The TAEAS Program provides environmental acoustics support to a number of Fleet commands. This support includes the development and maintenance of the tactical prediction model, ASRAP. Recently SAI has developed a set of modifications to the FACT Model (the transmission-loss component of ASRAP) to improve the treatment of surface ducts, rough surface scattering and cusped caustics. These model updates were assembled in an internally consistent form and provided to NORDA 320 under this contract. Complete technical documentation, source code listings and test cases are presented in a companion report.

Reference: Spofford, C.W., et. al., "Implementation of Rough Surface, Surface Duct and Cusped Caustic Improvements in FACT," SAI-82-471-WA (March 1981)

The three specific areas addressed by this effort are outlined below:

- (1) Rough-Surface Scattering Losses: prior to these modifications FACT assumed perfect specular reflection; specular losses as a function of frequency, grazing angle, and sea-state have been introduced.
- (2) Surface-Ducted Propagation: the Clay model has been replaced by an rms mode model with more appropriate environmental sensitivity and a more reasonable depth dependence.

- (3) Cusped Caustic Modifications: the treatment of the ray family associated with cusped caustics has been expanded to consider the possible presence of an imbedded smooth caustic.

Several major differences are observed in a review of the test cases generated by the modified version vice those obtained from the original FACT Model. Most notably these include:

- (1) Differences in Convergence zone descriptions
- (2) Sensitivity of non-ducted path to wave height
- (3) More detailed depth-dependence of surface-ducted propagation.

The net result is a more accurate propagation-loss prediction for environmental conditions that were previously either poorly treated or ignored.



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Report Number	Personal Author	Title	Publication Source (Originator)	Pub. Date	Current Availability	Class.
Unavailable	Unavailable	SELF-TENSIONING ACOUSTICAL HORIZONTAL LINE ARRAY (SPRAY) DATA ANALYSIS. FINAL REPORT OF BEARING STAKE TESTS JANUARY THRU MARCH 1977.	Sanders Associates, Inc.	790109	ADC017579	U
ARL/TR7924	Mitchell, S. K., et al.	VOLUME IVB. DATA POINTS 10, 11 AND 12 RAW DATA ANALYSIS OF ACOUSTIC BOTTOM INTERACTION IN BEARING STAKE (U)	University of Texas, Applied Research Laboratories	790223	ADE001369; NS; ND	U
TIU1886502F	Eichenberger, D.	REPORT FOR CHURCH STROKE II OCEANOGRAPHIC SERVICES	Texas Instruments, Inc.	790326	ADB036751; ND	U
Unavailable	Unavailable	FINAL REPORT, 1 NOVEMBER 1976-31 DECEMBER 1978	Xonics, Inc.	790430	ADB037987	U
Unavailable	Mitchell, T. M.	PREMOBILIZATION OF R/V INDIAN SEAL	Texas Instruments, Inc.	790531	ADB039703	U
Unavailable	Hays, E. E.	ACODAC AMBIENT NOISE PROGRAM	Woods Hole Oceanographic Institution	790601	ADB040404	U
LRAPPR79029	Unavailable	INTRODUCTION TO THE LRAPP ENVIRONMENTAL-ACOUSTIC DATA BANK (U)	Naval Ocean R&D Activity	790601	ADB041066; NS	U
USRD NO. 4807	Unavailable	MEASUREMENTS ON AQUADYNE MODEL AQ-1 ELEMENTS FOR THE UPGRADED LAMBDA ARRAY	Naval Research Laboratory	790802	ND	U
Unavailable	Ellis, G. E.	SUMMARY OF ENVIRONMENTAL ACOUSTIC DATA ANALYSIS	University of Texas, Applied Research Laboratories	790814	ADA073876	U
BR U0048-9C2	Unavailable	TAP III FINAL REPORT (U)	Bunker-Ramo Corp. Electronic Systems Division	790901	ND	U
OR/ITR1245	Moses, E. J.	OPTIONS, REQUIREMENTS, AND RECOMMENDATIONS FOR AN LRAPP ACOUSTIC ARRAY PERFORMANCE MODEL (U)	ORI, Inc.	790917	NS; ND	U
Unavailable	Colborn, J. G., et al.	EVALUATION OF STANDARD OCEAN CANDIDATES	Pacific-Sierra Research Corp.	800301	ADA087304	U
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Unavailable	Wilson, J. H.	WIND-GENERATED NOISE MODELING	Science Applications, Inc.	810401	ADA190143	U
Unavailable	Goit, E. H.	TOWED ARRAY PERFORMANCE PREDICTION SYSTEM - VERSION 1.2	Science Applications, Inc.	810701	ADB059397	U
3	Unavailable	FINAL REPORT	University of Texas, Applied Research Laboratories	810721	ND	U